

6.0 ASSESSMENT OF BENEFICIAL USE ALTERNATIVES

This chapter contains descriptions of various beneficial uses of dredged material and assessment procedures for beneficial use alternatives. The framework for assessments for beneficial uses is illustrated in Flowchart 3-4. The detailed assessments described in this chapter may be performed following a determination of the need for such assessments as described in Chapter 3.

6.1 Beneficial Use as an Alternative

Dredged material is a manageable, valuable soil resource, with beneficial uses of such importance that plans for the ultimate use of disposal sites should be incorporated into project plans and goals at the project's inception to the maximum extent possible. It is the policy of the USACE to fully consider all aspects of dredging and disposal operations with a view toward maximizing public benefits. Integral to this analysis is a requirement to provide full and equal consideration to all practicable alternatives, including beneficial uses of dredged material (see for example 33 CFR 337.9).

Whenever the dredging cycle and beneficial use needs have been found to coincide, beneficial use of dredged material has been considered as a management option. In many cases, beneficial use of dredged material has been identified as the preferred alternative. Unexpected new beneficial use needs may periodically arise (e.g., severe beach erosion from severe storms) and other factors such as development of more cost-effective dredging technologies may from time to time dictate a reevaluation of beneficial use options.

Authorities and constraints related to the beneficial use of dredged material are in a state of change. Provisions in the Water Resources Development Act of 1990 have now assigned to the USACE new authorities to pursue high-priority Fish and Wildlife Restoration projects where such projects can most efficiently or appropriately be accomplished in conjunction with existing or planned navigation projects. In addition, this legislation has assigned such projects equal mission status with navigation and flood control projects of the USACE. Thus, future beneficial use applications may, on a case-by-case basis, be either the preferred alternative for a navigation project, a cost-shared (ranging from 25 to 100 percent total local funding) action undertaken in association with the navigation project, or a separate, cost-shared project undertaken within the navigation project boundaries.

6.2 Identification of Beneficial Use Needs and Opportunities

The first step in assessment of beneficial use alternatives is to identify the local needs and opportunities for beneficial use. This may involve surveys of activities which may need material with certain characteristics or surveys of needs for certain site uses. Likewise, if the dredged material from a project is known to have desirable characteristics for a number of beneficial uses, then a survey of potential opportunities for use of that material or specific placement sites should be made. A general description of the major categories of beneficial use is given in the following paragraphs. Each of these categories should be considered in identifying needs and opportunities for beneficial use for the specific project conditions. Additional details on each of the categories are found in EM 1110-2-5026 (USACE 1986).

6.2.1 Habitat Restoration/Enhancement

Habitat development refers to the establishment and management of relatively permanent and biologically productive plant and animal habitats. Use of dredged material as the substrate for habitat development is one of the most common and most important beneficial use categories. The use of dredged material for habitat development offers a disposal technique that is an attractive and feasible alternative to more conventional disposal options. Within various habitats, several distinct biological communities may occur. For example, the development of a dredged material island may involve a wide variety of wetland, upland, island, and aquatic habitats.

Wetland habitat is a broad category of periodically inundated communities, characterized by vegetation which survives in wet soils. These are most commonly tidal freshwater and saltwater marshes, bottomland hardwoods, freshwater swamps, and freshwater riverine and lake habitats. Disposal of dredged material on a viable wetland so that the wetland is destroyed and converted into a disposal site is never an environmentally preferable alternative. However, restoration/enhancement of wetlands is an alternative that can benefit the environment and has the potential of gaining wide public acceptance when some other techniques cannot. In general, restoration of a former wetland is more likely to be successful than creation of a new wetland where none had existed previously (Kusler and Kentula 1990). In selecting a site, alteration of substrate and changes in circulation and sedimentation patterns should be considered. In general, the material used for wetland restoration should remain water-saturated, reduced, and near neutral in pH. These characteristics have a great influence on the environmental activity of any chemical contaminants which may be present. Extensive discussion on and procedures regarding development of wetland sites can be found in Hayes et al. (2000).

Upland habitat includes a broad category of terrestrial communities, characterized by vegetation that is not normally subject to inundation. Types may range from bare ground to mature forest. Regardless of the condition or location of a disposal area, considerable potential exists to convert it into a more productive habitat. Small sites in densely populated areas may be keyed to small animals adapted to urban life, such as

seed-eating birds and small mammals. Larger tracts may be managed for a variety of wildlife including waterfowl, game mammals, and rare or endangered species. The knowledge that a disposal site will ultimately be developed into a useful area, be it a residential area, a park, or wildlife habitat, improves public acceptance of the dredged material disposal alternative.

Many island habitats have been created by placement of dredged material, varying in size and characteristics and ranging in age from newly formed to those estimated to be 50 years old. The primary wildlife species utilizing dredged material islands as part of their life requirements are species of colonial-nesting waterbirds. Natural islands have been altered and developed to such a large extent that some areas no longer have coastal islands that are still suitable wildlife habitat. Dredged material islands have provided this vital habitat in many areas.

Aquatic habitats are typical submerged habitats extending from near sea, river, or lake level down several feet. Aquatic habitat development is the establishment of biological communities on dredged material placed at or below mean tide in coastal areas and in permanent water in lakes and rivers. Potential developments include such communities as tidal flats, seagrass meadows, oyster beds, clam flats, fishing reefs, and freshwater aquatic plant establishment. The bottom of many water bodies potentially could be altered using dredged material; this could simultaneously improve the characteristics of the site for selected aquatic species.

6.2.2 Beach Nourishment

Shore erosion is a major problem along many ocean and estuary beaches and the shoreline of the Great Lakes. Beach nourishment is usually accomplished by dredging sand from inshore or offshore locations and transporting the sand by truck, by split-hull hopper dredge, or by hydraulic pipeline to an eroding beach. These operations may result in displacement of the substrate, changes in the topography or bathymetry of the borrow and replenishment areas, and destruction of nonmotile benthic communities. However, a well-planned beach nourishment operation can minimize these effects by taking advantage of the resiliency of the beach and nearshore environment and its associated biota, and by avoiding sensitive resources. When dredged material is used for beach nourishment, it should closely match the sediment composition of the eroding beach and be low in fine sediments, organic material, and pollutants. Beach nourishment and protection can also be accomplished by placement of dredged material mounds or berms on the bottom, where much of the material would be carried by wave action to the beach.

6.2.3 Aquaculture/Mariculture

Because of the increasing difficulty and expense of obtaining CDFs for use as single purpose disposal areas, the development of a multiple-use strategy such as aquaculture or mariculture is desirable. Dredged material containment sites commonly possess structural features such as dikes and water control devices that may enhance their suitability as aquaculture areas. It is possible that future site availability would be

improved by increased value of acreage leased to dredging project sponsors because land-owners could enter separate and profitable lease agreements with aquaculturists. See also section 6.2.1.

6.2.4 Parks and Recreation

Of all types of beneficial uses, recreation on dredged material containment sites is one of the most prevalent land uses in terms of actual acres. It is not surprising to find many examples of such use since there is such a demand for recreational sites in urban areas where much dredging occurs. The nature of recreation sites with requirements for open space and lightweight structures is especially suited to the weak foundation conditions associated with fine-grained dredged material. Recreational land also is generally for public use, and high demand for public water-oriented recreation encourages the development of recreational land use projects on dredged material. Finally, legislation relating to wetlands, coastal zone management, and flood control is biased in favor of this type of use. The recreational land use of dredged material containment sites is one of the more promising and implementable beneficial uses of dredged material, but is heavily dependent on financial backing at the local level.

6.2.5 Agriculture, Horticulture, and Forestry

Broad use of dredged material disposal sites has been made by the agriculture, forestry, and horticulture industries. Some disposal sites, especially in river systems, have provided livestock pastures following seeding or even natural colonization. Other uses involve actively incorporating dredged material into marginal soils. An attractive alternative for disposing of dredged material is to use this rich material to amend marginal soils for agriculture, forestry, and horticulture purposes. By the addition of dredged material, the physical and chemical characteristics of a marginal soil can be altered to such an extent that water and nutrients become more available for crop growth. In some cases, raising the elevation of the soil surface with a cover of dredged material may improve surface drainage and reduce flooding, thereby lengthening the growing season.

6.2.6 Strip Mine Reclamation and Landfill Cover for Solid Waste

Two beneficial uses of dredged material that are still fairly new concepts have proven to be feasible in laboratory and field tests. These are the reclamation of abandoned strip mine sites that are too acidic for standard reclamation practices and the covering of solid waste landfills. Both uses would require large quantities of dewatered dredged material that could be moderately contaminated and still be acceptable. Both uses would ultimately provide nonconsumptive vegetative cover to unsightly areas, and the areas could be further reclaimed for minimal-use recreation sites and/or wildlife habitat.

6.2.7 Industrial/Commercial Development

Industrial/commercial development near waterways can be aided by the availability of hydraulic fill material from nearby dredging activities. The use of dredged material to expand or enhance port-related facilities has generally received local support because of the readily apparent potential benefits to the local economy. Approval of the disposal operation is generally predicated on the advancement of the port development project and not on the incidental need for proper disposal of the dredged sediments. Use of dredged material to reclaim former industrial sites (brownfields) for other uses has also been considered in some areas.

6.2.8 Material Transfer for Fill

Dredged material is commonly used in construction of dikes, levees, and CDFs. Dredged material, pumped on site and dewatered, readily lends itself to these uses. By using dredged material to build or increase capacity in CDFs, or for dikes and levees, overall project costs may be reduced by not having to use off-site material for these purposes. Some local and state agency and private use is made of dredged material for dikes and levees in certain situations such as for erosion and flood protection. Thousands of cubic yards of dredged material have been dewatered in holding areas, then provided to public or private interests for fill material. Often, the material is provided free of charge to make room in disposal sites for subsequent disposal.

6.2.9 Multipurpose Uses and Other Land-Use Concepts

With careful engineering design, construction, long-term coordination and planning, and proper implementation of operational and maintenance procedures, a disposal site having combinations of uses may be developed. A park and recreational development built over an existing solid waste landfill using dredged material as a cover is an example of how several of the beneficial uses discussed in the preceding sections can be lumped into a multipurpose project. There are a number of actual and planned examples of multipurpose sites. Often, multipurpose objectives do not involve substantial cost increases to the dredging project when plans are made in the initial phases of design and construction. Frequently, recreational use and wildlife and fish habitat can be developed simultaneously on a disposal site. Potential problems with development of multipurpose projects are usually related to conflicting user groups of the proposed disposal/development site. Careful selection of compatible potential users can avoid situations where the projected uses conflict.

6.3 Evaluate Physical Suitability of Material

Basic data on physical characteristics of the sediments to be dredged (see section 3.5.2) can often serve as an effective initial screen to determine if proposed beneficial use options as identified above are sufficiently feasible to warrant more detailed evaluations. Grain-size compatibility with the intended beneficial use is often a major consideration. In most cases, clean, coarse-grained sediments (sands) are suitable for a wide range of

beneficial uses. However, fine-grained sediments are also suitable for some beneficial uses, such as wetland habitat development, soil creation and improvement and construction blocks. Testing procedures to determine the suitability of dredged material for beneficial uses is provided in Winfield and Lee (1999). Dredged material that is contaminated may be useful for beneficial uses if some treatment is applied to reduce contamination. Low-cost treatment alternatives include bioremediation and phytoremediation. Procedures for determining the suitability of dredged material for these remediation alternatives are provided by Fredrickson et al. (1999) and Price and Lee (1999).

6.4 Logistical Considerations for Beneficial Use

A number of procedural and logistic factors can also greatly influence the feasibility of specific beneficial use proposals. Examples of logistic considerations include: distance of the proposed beneficial use site from the dredging project; site accessibility; required equipment to dredge the channel (e.g., hopper dredge in high-energy approach channels) versus equipment required to efficiently transport the material to the site (e.g., quite often a pipeline dredge); material rehandling requirements; size of project versus intended beneficial use and size of disposal site (e.g., a 30-in. dredge required to efficiently move large volumes of shoal material may very quickly overwhelm a small wetland restoration site); and timing of the beneficial use need (e.g., beach nourishment) versus maintenance dredging needs.

Less understood, but perhaps one of the greatest potential constraints to many potential beneficial use proposals is what may collectively be termed real estate considerations. These include state, county, and local land-use zoning laws (which can be extremely variable and complex); issues of ownership of the material (e.g., Submerged Lands Act); whether disposal sites are fee-owned or disposal is through easements; and the closely related issue of sponsor requirements for acquiring and managing disposal sites as contained in the project-specific authorizing legislation. A typical example would be disposal sites acquired through easement by the project sponsor under his assigned responsibility within the authorizing project legislation. Ownership of the material may well reside with the landowner, not the Federal government or project sponsor, which could eliminate further consideration of that site for certain beneficial uses. In some cases, such constraints might be overcome if the sponsored landowners are willing to renegotiate the real estate agreements. In other cases, however, specific Federal and/or state/local legislation would be required to overcome such constraints.

6.5 Determination of Environmental Suitability

Generally speaking, highly contaminated sediments will not normally be suitable for most proposed beneficial uses and particularly for proposed habitat creation/restoration projects. Conversely, if the material is exempt from testing (e.g., 40 CFR 230.60) or testing indicates the material is suitable for open-water disposal, that material would likely be deemed suitable for a wide range of beneficial use applications from the standpoint of contamination. Most beneficial uses involve either open-water or

confined placement as an integral part of the application or an initial step in developing the application. Therefore, the testing and assessment procedures as well as compliance with the overall 404 Guidelines themselves, must also be considered for beneficial uses (see Chapters 4 and 5).

There is considerable interest in removing dredged material from confined placement and using the material as a resource for construction material or topsoil to restore capacity of existing CDFs. Many dredged materials currently contained in CDFs will support desirable vegetation with little input other than fertilizer. Efforts to alter undesirable dredged material characteristics by adding organic materials such as yard litter (leaves, grass and tree trimmings) animal manures or other biosolids can provide characteristics necessary to produce soil material for containerized plants, bedding plants and turf grass. With local support to provide materials that are normally considered waste (yard litter and biosolids), valuable soil materials can be produced for use in local projects such as brownfield redevelopment, road construction, parks and recreation fields. Since the purpose of most CDFs is to contain contaminated materials, the issue of reuse poses some question as to the suitability of the material for beneficial uses outside the CDF and there is currently no clear guidance specifically addressing suitability of dredged material for beneficial uses. Some states have set standards for contaminants in industrial waste materials and have included dredged material in that category. Other criteria may be applicable, such as Ecological Soil Screening Levels or USEPA 503 Regulations for the application of biosolids, but the criteria for suitability will be determined by the State or local authority where the dredged material will be used. The Great Lakes Upland Testing and Evaluation for Beneficial Use project is an interagency effort to compile existing guidance, criteria, testing recommendations and case studies to facilitate consensus building in the regulatory and scientific communities for beneficial use of dredged material. A briefing paper that also includes an extensive annotated bibliography with references relevant to beneficial use of dredged material has been published by the working group (Great Lakes Commission 2004).

For ongoing activities, periodic reevaluations are advisable to ensure that the conditions regarding sediment contaminants have not changed since the last dredging cycle. For new applications and particularly for habitat development applications, it will, at times, be advisable (depending on the nature and source of the dredged material) to conduct limited plant and/or animal bioassays to ensure that the material will not be harmful to the target species. Examples of such situations may be when highly saline material is to be used in a brackish or freshwater habitat development project, or if the material is to be used for upland habitat development or portions of the site will be emergent. In some cases, chloride and/or heavy metal toxicity may or may not be problematic but should be sufficiently evaluated for this potential.

6.6 Retention of Environmentally Acceptable Beneficial Use Alternatives

Once appropriate assessments are complete, a determination of environmental acceptability can be made. This determination must ensure that all applicable standards or criteria are met. If control measures were considered, a determination of the effectiveness

of the control measure in meeting the standards or criteria must be made. If all standards or criteria are met, the beneficial use alternative can be considered environmentally acceptable. At this point, other factors can be considered in the selection of an alternative as discussed in paragraph 3.6 and Chapter 7.